WELCOME!

ERDC
Engineer Research and Development Center

Nearshore Berm Working Meeting
5-6 March 2014

Jeff McKee
HQ Navigation Business Line Manager

Jeff Lillycrop
Technical Director

Eddie Wiggins
Associate TD

RSM/CIRP Nearshore Berms R&D Team

- Tanya M. Beck, Cheryl Pollock, Jay Rosati, and Kelly Legault (SAJ)
- Katie Brutsche & Ping Wang (USF)

- Collaborative W.U.
  - Coastal Inlets Research Program (CIRP)
  - Regional Sediment Management (RSM)
- Linda Lillycrop (RSM)
- Julie D. Rosati (CIRP)

Statements of Need

Design and Evaluation Tool for Nearshore Berm Placement of Non-Beach Compatible Material
Tracking Number 2011-N-15

Nearshore Placement of Dredged Sediment Assessment
Tracking Number 2011-N-19

Goal of This Meeting

- For Districts and Researchers to gain an understanding of the Nationwide Experiences and Challenges in nearshore placement projects.
  - Primarily spend time discussing and cataloging District experiences, ideas, and future needs.
  - Some initial discussion from the research side of engineering nearshore berms.
  - Conversation about different District's experiences: approaches, designs, limitations, challenges, USACE processes (3x3x3, 3 yrs., <3M, 3 reviews), and more.
- Summarize District experiences, national priorities, R&D needs, and future steps.

Meeting Participation

- 52 people in total
- 32 District employees representing 12 district offices
- 23 of the District participants joined the meeting through webinar for only the 5 March 2014 morning sessions.
- 20 Engineering Research and Development Center's participants.

- The District offices represented were:
  - LRE
  - LRB
  - NAE
  - NAP
  - SAJ
  - SAW
  - SAS
  - SWG
  - SPL
  - SPN
  - NWP
  - NWS

Introduction to the Physical Processes

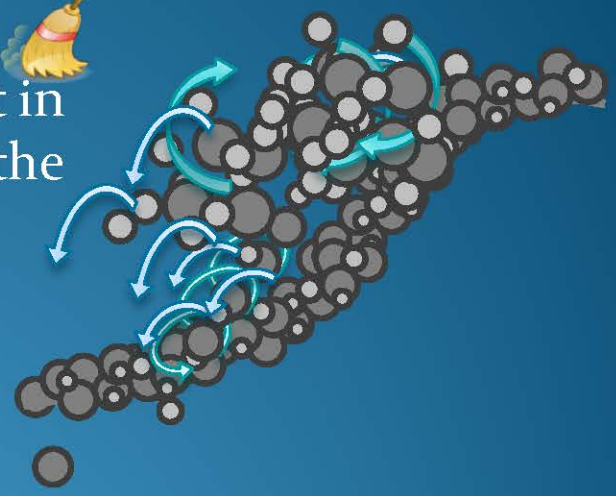
- Nearshore Placement: Engineering Considerations to Optimize Benefits, Kelly Legault, SAJ
- Cross-Shore Theory ("Don't draw a line in the sand"), Rod Moritz, NWP
- Depth of Closure Around the Nation, Cheryl Pollock ERD
- Sediment Mobility in the Cross-shore, Cheryl Pollock and Jay Rosati, ERD
- LSTF Nearshore Berm Experiment (2011), Ernie Smith, ERD
- FRF Experiment Update, Julie Rosati, ERD

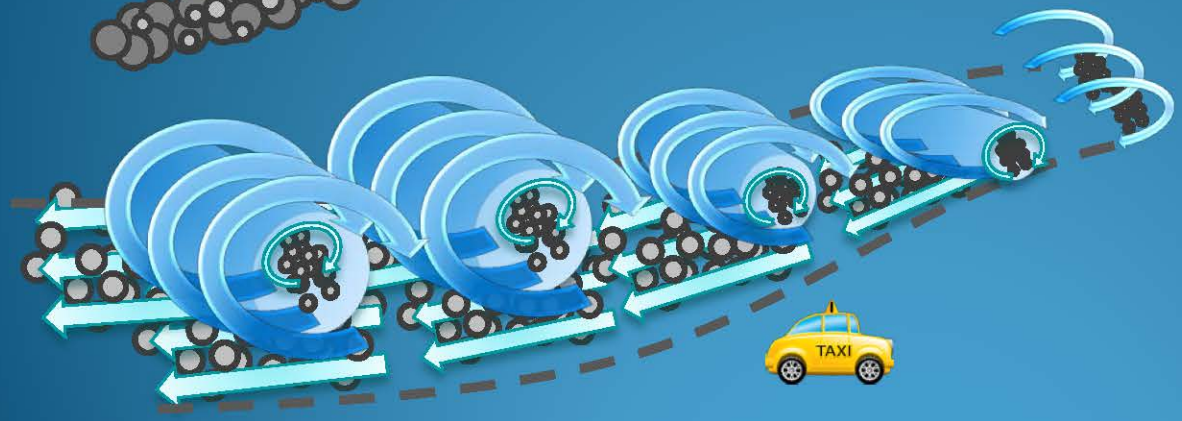
Destructive Forces that move sediment offshore

. . . an incomplete list

- Gravity. Tries to make a profile horizontal

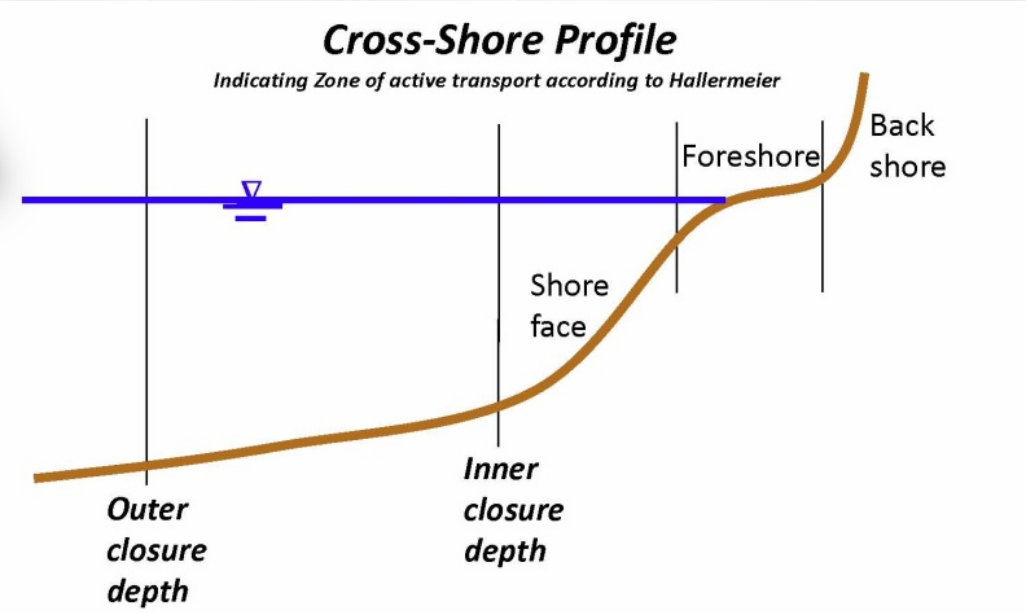
- High Turbulence. Picks up sediment in the s.z. and, with the help of gravity, moves them offshore

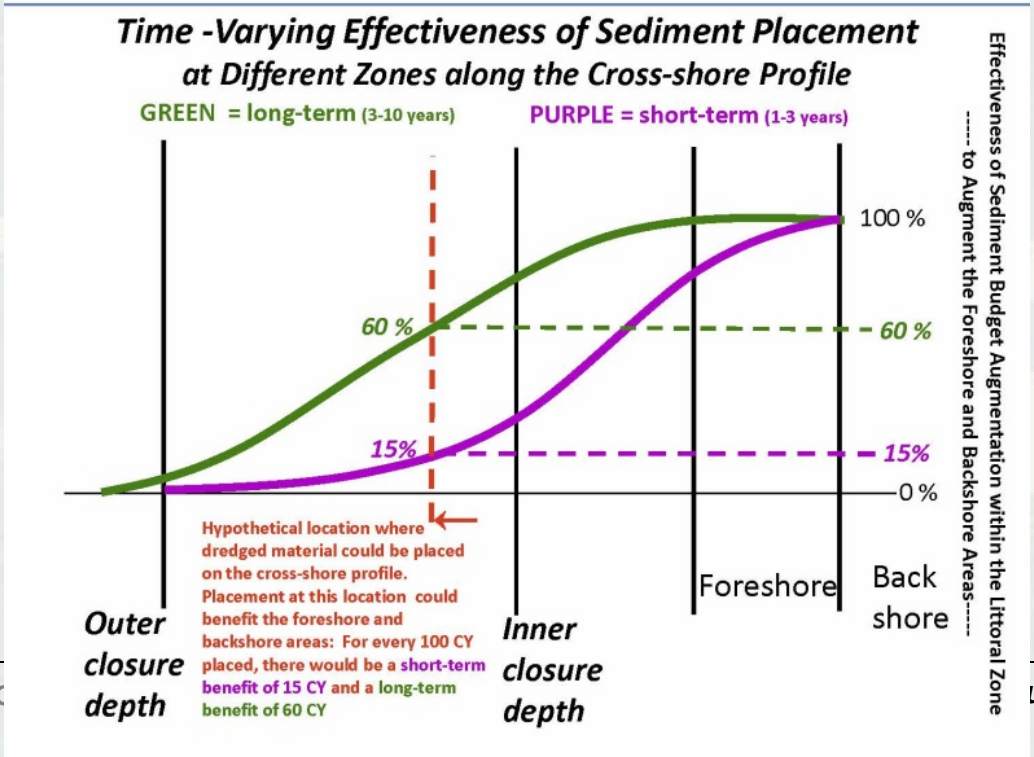




Kelly Legault, SAJ

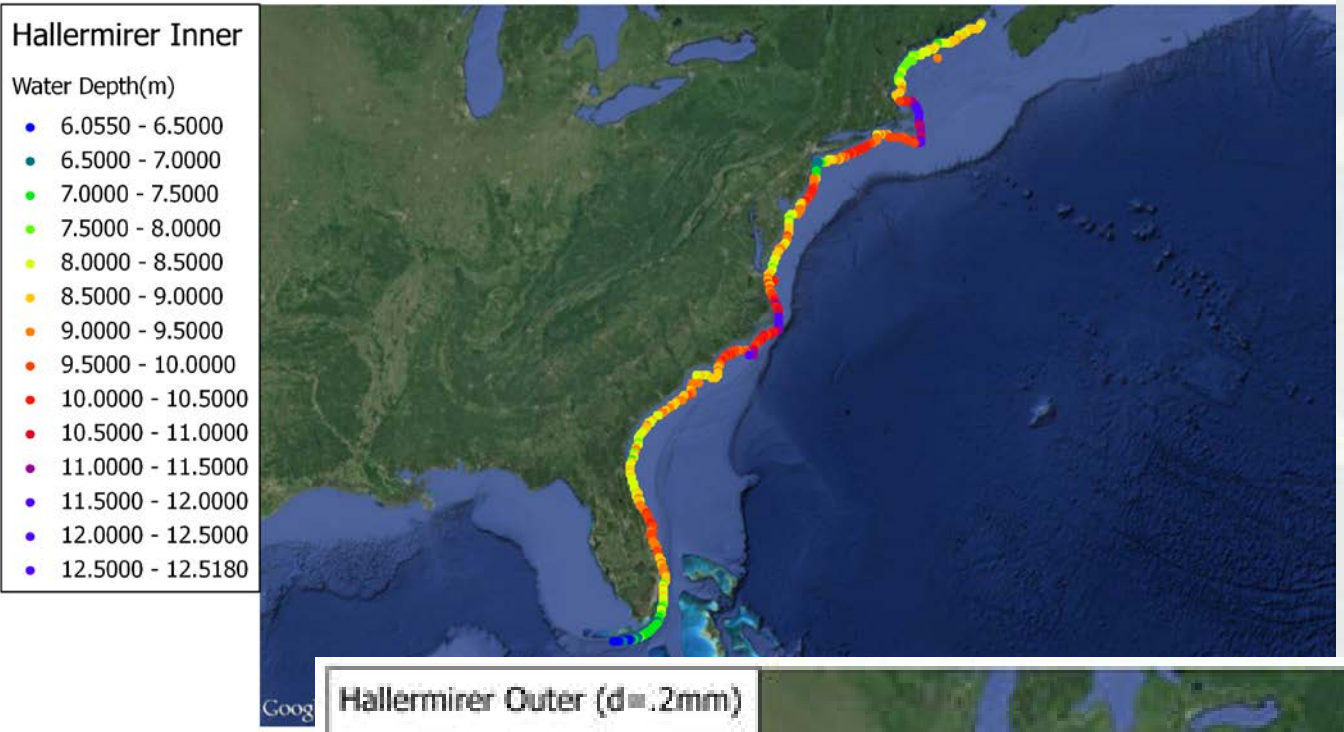
- Undertow. Seaward return of wave-induced mass transport (surface roller)



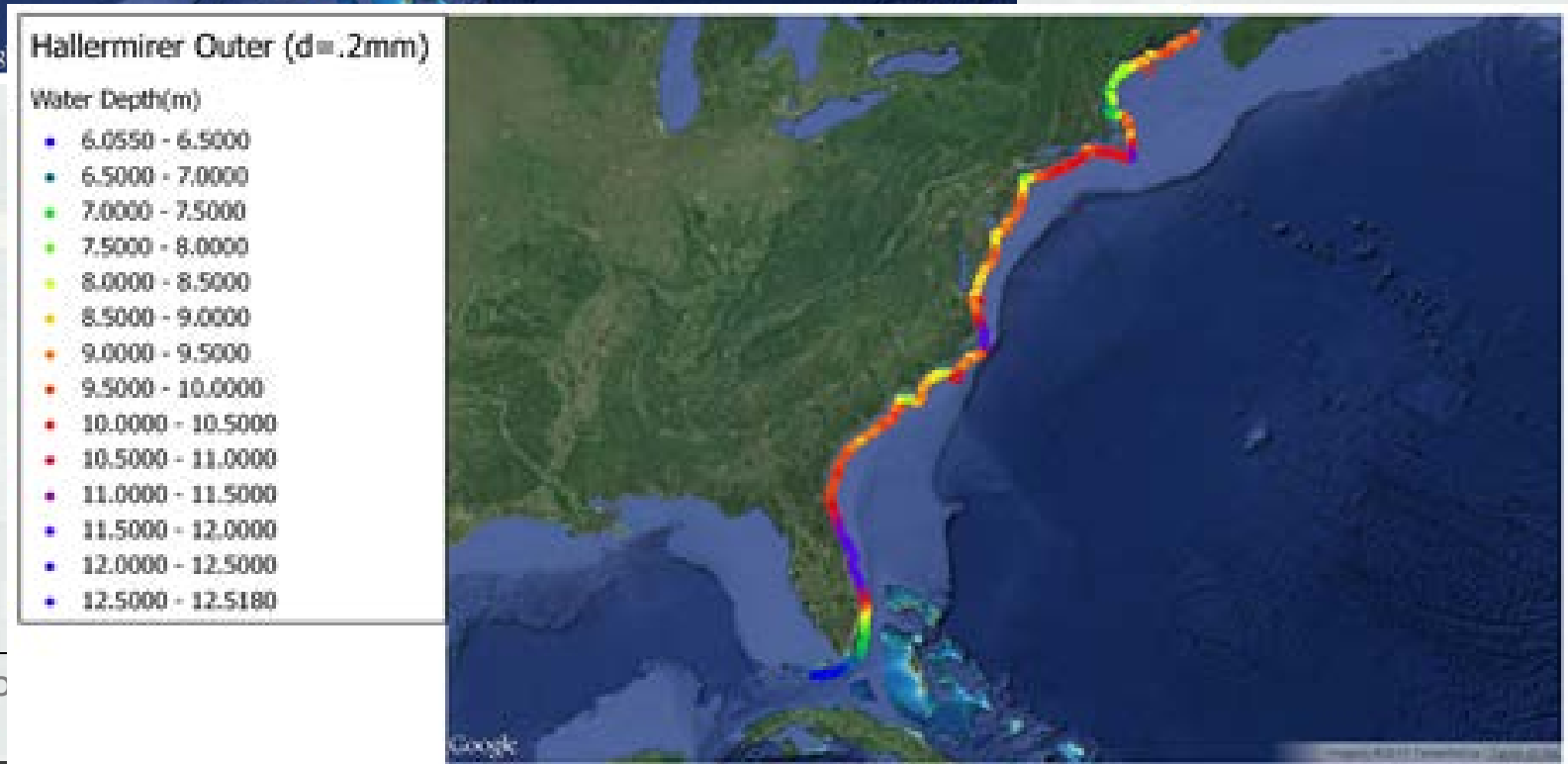


Rod Moritz, NWP

CHL
Coastal and Hydraulics Laboratory



DoC
Cheryl Pollock
Jay Rosati



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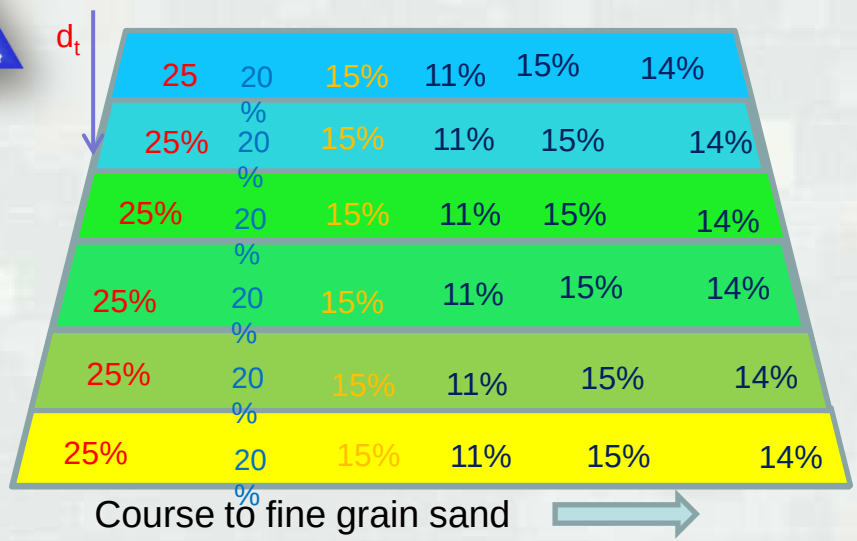
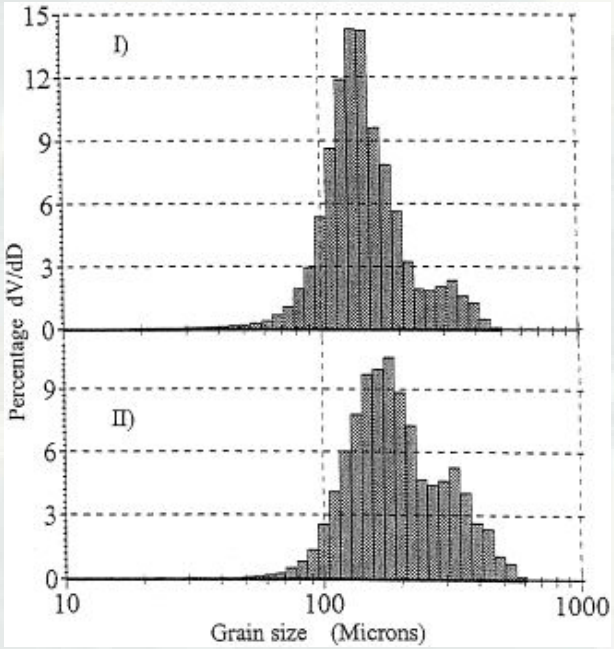
7 ways to look at berms differently- Pollock & Jay Rosati





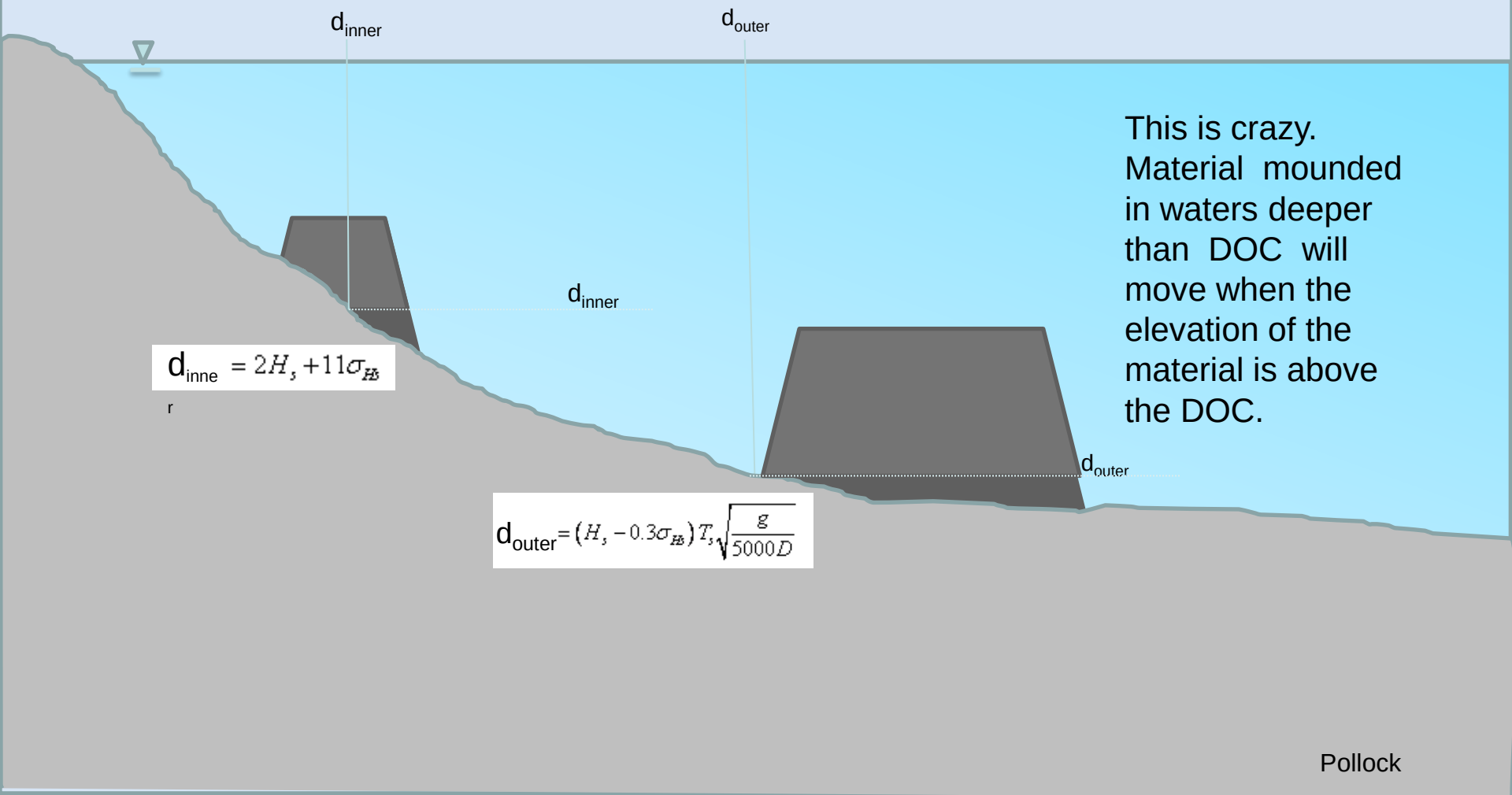
Where V_t is a function of time, depth, and the wave field.

$V(t)= (H, T, d, t)$ and $d(t)= (t, T, H)$.

5. Layers and % Volume by grain size

Siting Berms and MMV

Previous methods site berms based on the berm's **foot print** and identifying berm as being stable or active by applying Hallermeier's equations for "depth of closure". The practice has been to place the berm offshore of the d_{outer} for a stable berm and inshore of d_{inner} for a active berm. Many times the location of the permitted placement and the potential berm site does not reside within only one of these regions but, often bridges a zones. Because we look at plan view maps, many of us see vertical lines for DOC instead of horizontal levels in the water column.



This is crazy. Material mounded in waters deeper than DOC will move when the elevation of the material is above the DOC.

Pollock

Overview of Mound/Berm Experiments

Ernie Smith

- Three experiments and Base case at a 1:20 scale
- Berms were located at ~11 and 4 ft prototype depths, and placement onshore.
- Berms were dyed to increase contrast between placed material and beach
- Incident wave conditions simulated an offshore wave of H_{mo} = 10.8 ft, T_p = 6.7 sec and θ_b = 6.5 deg from shore normal.

- Although berm material was transported downdrift:
  - Sand stayed in the surf zone
  - Sand accumulation was observed on the beach and shoreline due to the presence of the nearshore placed material

Field Research Facility Experiment

CHL Coastal and Hydraulics Laboratory

Coast, Estuary and Overland Processes

Julie Rosati

Target Date: Sep FY15- Sep FY17

- Coastal experiments on Atlantic
- Estuary experiments in Currituck Sound
- Overland environmental measurements
- Multi-R&D, multi-agency experiment

C2SHORE

CFDC ERDC-EL

US ARMY CORPS OF ENGINEERS: ENGINEER RESEARCH & DEVELOPMENT CENTER

Field Research Facility

Advancing Coastal Knowledge Through Observation & Discovery

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District Presentations

- Colleen O'Connell, NAB, Fair Port Harbor
- Jase Ousley, SAJ, Kings Bay Nearshore Analysis
- Monica Chasten, NAP, Tidal Inlets
- Jarod Norton NWP, Columbia River/Benson Beach Nearshore Placement
- John Dingler, SPN, Half Moon Bay

Hands and Allison/Hallermeier

CHL Coastal and Hydraulics Laboratory

Jase Ousley, SAJ,
Kings Bay Nearshore

Hallermeier

Mean mean monthly wave height H_s

Std Dev of mean monthly wave height σ_{Hs}

Mean mean monthly wave period T_s

$g =$ 9.80665 m/s^2

Mean sediment grain size $D = d_{50} =$ - m

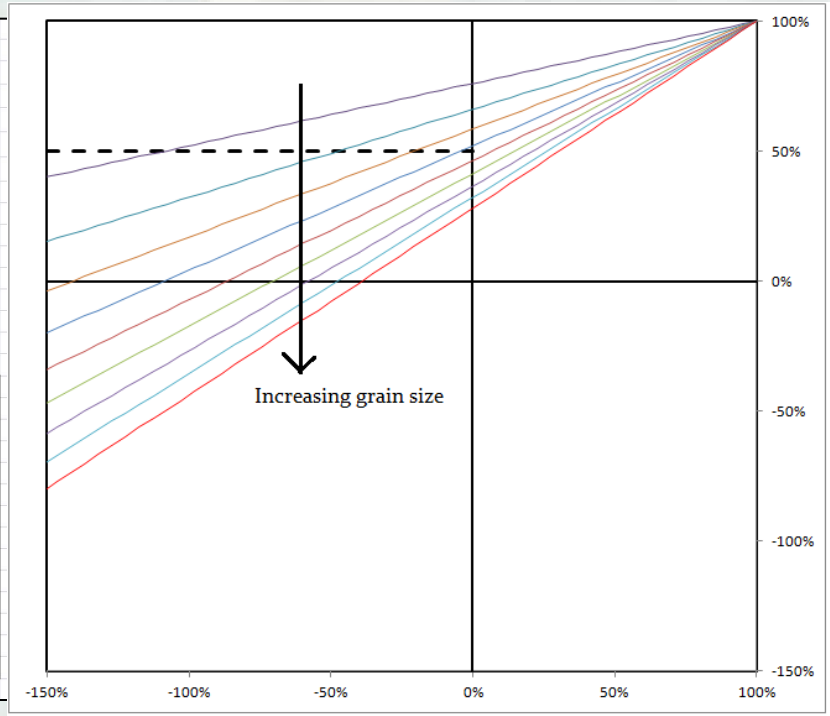
Hallermeier inner limit

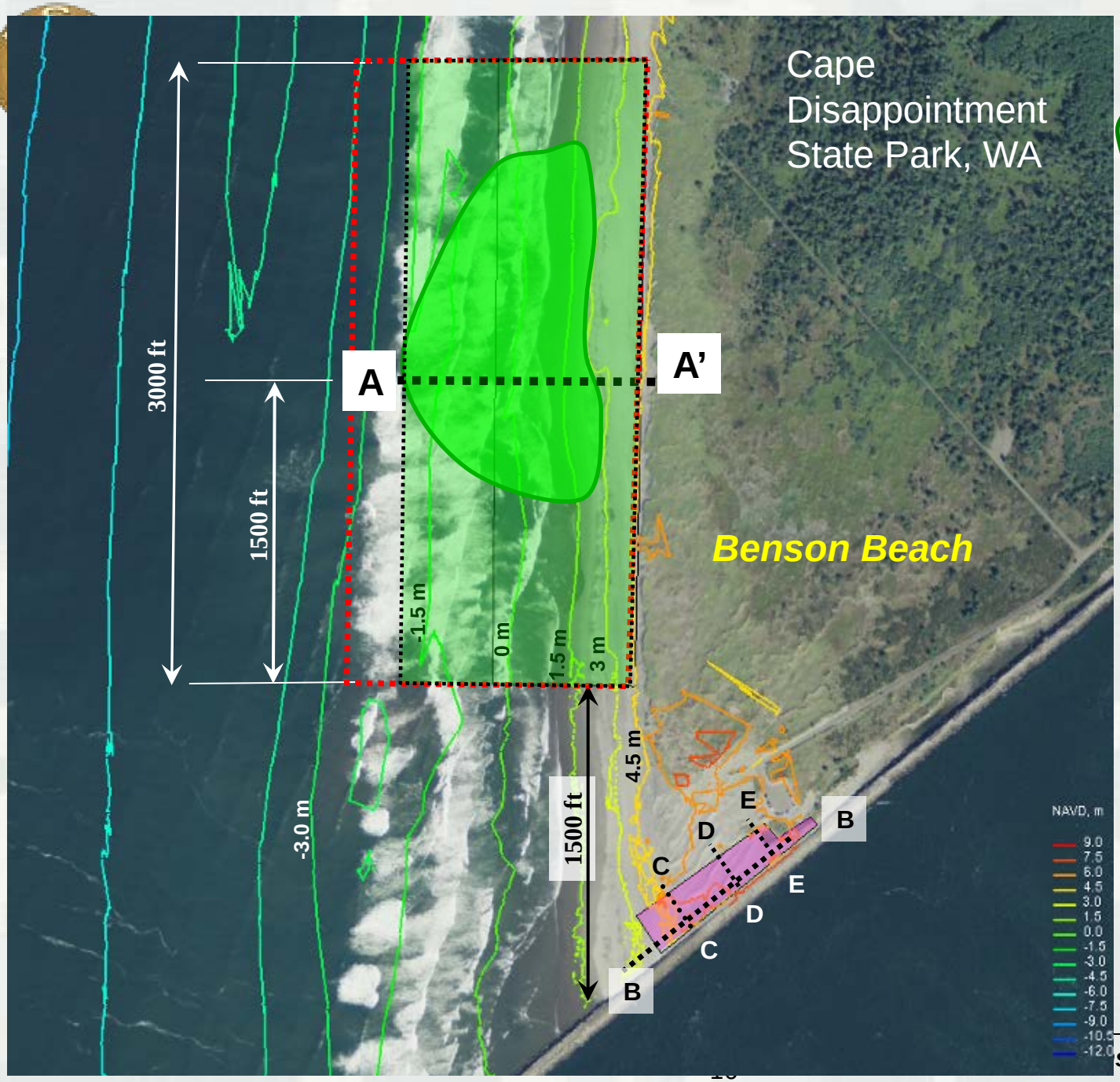
$$D_{inner} = 2H_s + 11\sigma_{Hs}$$

Hallermeier outer limit

$$D_{outer} = (H_s - 0.3\sigma_{Hs})T_s\sqrt{\frac{g}{5000D}}$$

	grain size (m)	H_s (m)	σ_{Hs}	T_s (sec)	d_{inner} (m)	d_{outer} (m)	d_{inner} (ft)	d_{outer} (ft)
0.1	0.0001	0.9	0.4	8.1	6.3	26.3	20.7	86.4
0.2	0.0002	0.9	0.4	8.1	6.3	18.6	20.7	61.1
0.3	0.0003	0.9	0.4	8.1	6.3	15.2	20.7	49.9
0.4	0.0004	0.9	0.4	8.1	6.3	13.2	20.7	43.2
0.5	0.0005	0.9	0.4	8.1	6.3	11.8	20.7	38.6
0.6	0.0006	0.9	0.4	8.1	6.3	10.7	20.7	35.3
0.7	0.0007	0.9	0.4	8.1	6.3	9.9	20.7	32.6
0.8	0.0008	0.9	0.4	8.1	6.3	9.3	20.7	30.5
0.9	0.0009	0.9	0.4	8.1	6.3	8.8	20.7	28.8
1	0.001	0.9	0.4	8.1	6.3	8.3	20.7	27.3
1.1	0.0011	0.9	0.4	8.1	6.3	7.9	20.7	26.0
1.2	0.0012	0.9	0.4	8.1	6.3	7.6	20.7	24.9





WA Littoral Drift Placement Area

CHL Coastal and Hydraulics Laboratory

= Expected areal extent for deposition

North Jetty Berm (Foredune) Repair Placement Area.

Contours, m NAVD
From Sept 2009
Interval = 1.5 m

Jarod Norton Presented for Ott, Moritz, and Kiminsky–Columbia River/Benson Beach – A success Story

ERDC

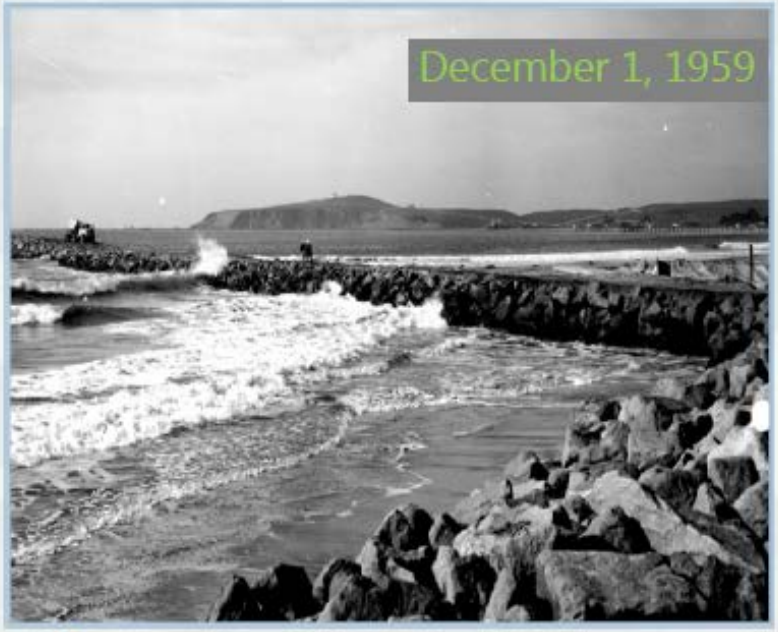
s for a safer, better world

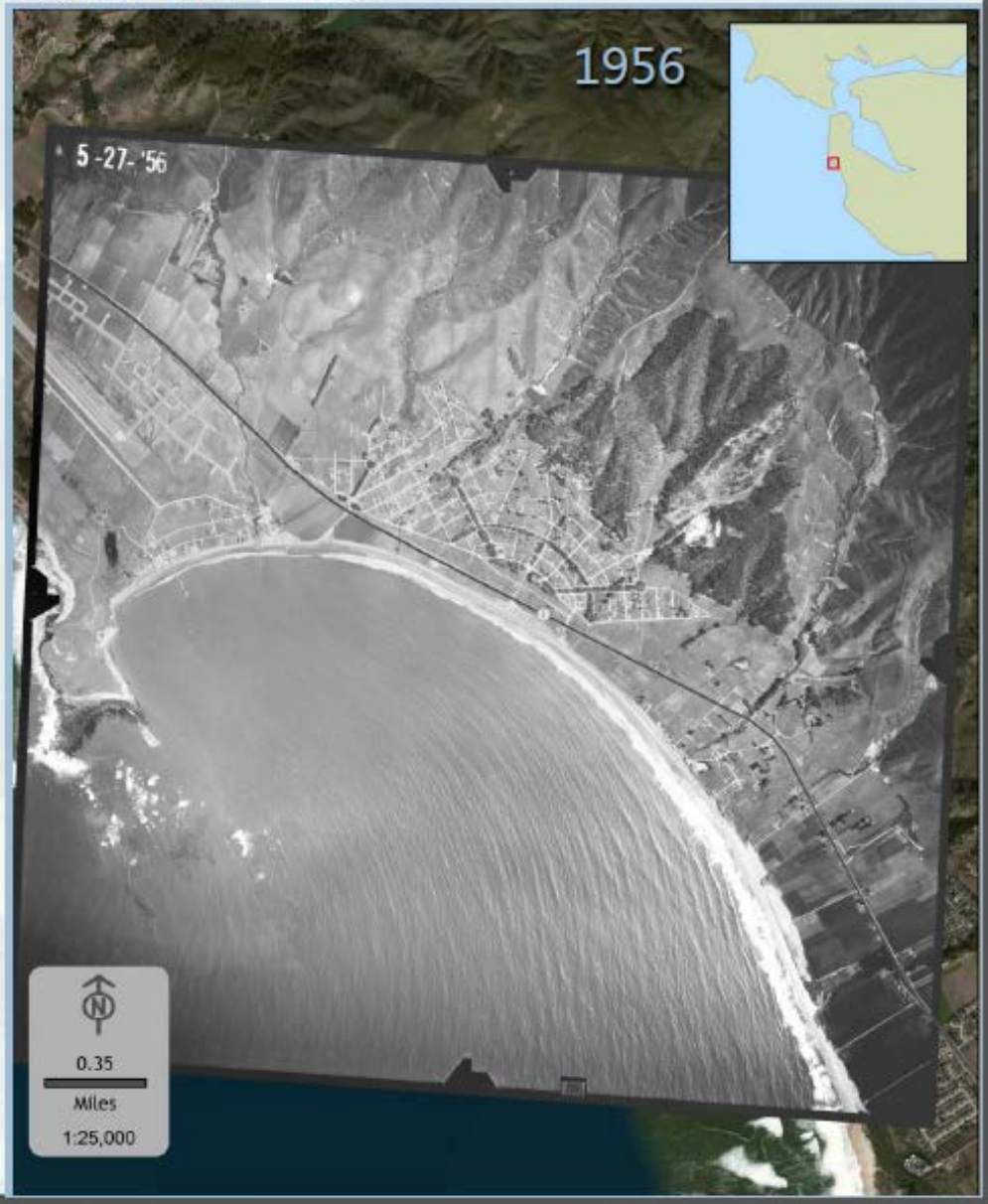
North Half Moon Bay (Pillar Point Harbor), California

John Dingler

CAP 111 Project

Mitigation of Damages Caused by a Federal Navigation Project





US Army Corps of Engineers
San Francisco District
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Definitions and Organization

- A series of straw-man table were developed to help organize the meeting and document a path forward:
  - Nearshore Berm Vocabulary
  - Dredge Capability
  - Applicable Tools
  - Challenges, Success, and Research Needs,
  - Nearshore Berm Evaluation Criteria- Quantify Benefits and Impacts

- Table 1-3, handed out for review and comment by the participants
- Table 4 was the primary focus of the meeting
- Table 5 is a starting point to develop standardized criteria and language to aid communication and negotiation for nearshore placement approval and evaluation. The objective is to crate methods to “Quantify Benefits and Impacts”

Table 4 Challenges Successes and Research Needs

- Challenges and successes statements - issues that districts need help resolving (or had found a solution) in relation to design, authorization, or evaluation of nearshore berms or nearshore placement
- C&S Examples:
  - Convincing state regulators to allow mixed material in nearshore
  - Develop timelines or timescales to relate beneficial impacts of NSP
  - Identify a list of current regulations and permitting requirements around the nation
- Districts were solicited for most pressing C&S statements
- 53+ C&S were developed and organized into topic areas for group evaluation

Physical, Environmental, and Social Issues

- Divided into three breakout groups
  - Benefits and Resource Agencies
  - Physical Processes Related to Nearshore Berms
  - Environmental Issues Related to Nearshore Berms
- Individuals joined groups based on their experience
- As groups:
  - select or make up 5-10 challenges
  - Evaluate Challenges
- District member of team to present results

Group Evaluation of Challenges

- **Solution**
  Existing or proposed methods, thought process, or equations that address the challenge.
- **Tools**
  A list of existing tools, methodologies, or models that can be used to address the challenge.
- **What We Can or Can't Answer Now**
  With the existing tools, what can we answer now and what can we not. If we can answer this challenge would it benefit to have an operations objective to answer this challenge for the nation?
- **Deficiencies and Successes**
  In addressing the challenge, what worked well and why? What didn't work well?
- **Tool Changes, Research Needs, Literature Development, and Communication Tools**
  Is there a module or a physical relationship that needs to be developed?
- **% Improvement**
  If the challenge can be answered, what % better is our answer for the investment that will be required?
- **Low Hanging Fruit**
  What can we do this year?
- **Priorities**
  Is this a "Must Have" tool or research endeavor?

Results: Physical Issues

- 26 Challenges to start with
- Boiled down to:
  - Three topics for material placed in the nearshore
    1. **Material Mobility-** will the berm move?
    2. **Material Migration-** Where will the material go?
    3. **Time scales applied to material movement –** how long will it take for the berm to move
       - Initiation
       - Deposition

Evaluation: Physical Processes

- **Solution**

  Hallermeier DoC, Look at wave shape, Shields equation, bed-stress, create mobility indices, bed-stress/sediment transport
- **Tools**

  CMS model, NOAA Buoy, CDIP Bouy & IOOS measured data, Wave Statistics Probability –motion vs. time, CSHORE model
- **What We Can or Can't Answer Now**

  - no entry
- **Deficiencies and Successes**

  - Difficulty quantifying benefits when can't measure morphologic changes.

  - Too small scale, can't calculate statistics

  - Developing the monetary benefits

  - Lack of funding limits model usage
- **Tool Changes, Research Needs, Literature Development, and Communication Tools**

  - tool or web app to rapidly calculate sediment transport

  - look-up table for CMS wave~= providing sediment mobility

  - make a stripped down version of the models for district level feasibility studies, SMART3X3X3 interactive

Evaluation: Physical Processes
Continued

- **% Improvement** *- no entry*
- **Low Hanging Fruit**
  1. *CSHORE Model: need to see what the model can do and compare to yield results*
  2. *Develop low cost tracer methodology for Monitoring to look for affects of dispersed vs a built up trapezoidal berm– **SoN** submitted*
  3. *Build a LSTF model using Duck, NC as reference site, then Berm Field experiment in future at Duck, NC*
  4. *CMS Wave Look-up Tables or Matrices*
  5. *North Atlantic Comp Study: provide additional data to WIS data for DoC study*
  6. *Look at buoy data or statistical data to see when transport is accruing (i.e. Mobility index)*
  7. *Develop a stripped down Web app for determining transport and rates. Look at one point to get info using transport rates*
- **Priorities -***When asked if they could rank them all Must Have, would they?, The group replied - yes*
  - *Motion of material? – Must Have*
  - *Where does it go? – High priority*
  - *When ? – Medium priority*

Results: Environmental Issues

- 14 original challenges
- Boiled down to 4
  1. Impacts to Resources
  2. Physical Processes – Fate of Fines
  3. Risk and Re/De-regulation
  4. Better Understand sediment character/composition change through dredging processes

Evaluation: Environmental Issues

- **Solution**

Quantify effects on data –

-bracket impacts to background conditions

-monitor field cases

-Perform lab experiments to quantify critical levels to create impacts

-instantaneous vs. chronic impacts

Standardize Process monitoring-

-parameterize models

-develop BMP's

-standardize protocols for sampling

Identify Increased and decreased risk for each receptor(weight avg.)

Changing the description from individual species to the entire region - benefits and drawbacks

Increased effort to quantify reduction of fines by sampling in hopper/discharge pipe

Tools

-Exposure models-EL ecological models?

-Physical process models-PTM, dredging models(CORMIX,CDFATE,STFATE)

-Risk analysis tools developed for SANDY

Evaluation: Environmental Issues

- **What We Can or Can't Answer Now**
  - *We are guilty until proven innocent*
  - *Can't quantify reduction of fines occurring*
  - *Can't determine fate of discharged sediments*
- **Deficiencies and Successes**
  - *Our track record is not good at removing regulations*
  - *Breaking waves are currently not monitored*
- **Tool Changes, Research Needs, Literature Development, and Communication Tools**
  - *We need demonstration projects*
  - *Dredging models need to be modified for current processors capabilities and nearshore placement*
  - *Use remote sensing technology*
  - *Risk analysis tools for nearshore berms*
  - *Standardize data and more data on Sediment character changes from various dredge processes*

Evaluation: Environmental Issues

- **% Improvement -**
  - *Could reduce project restraints, costs, and windows*
  - *Reframe the debate*

- **Low Hanging Fruit**
  - *GIS layers mapping of all resources of concern globally, geospatially*
  - *Standardize measurement protocols-parallel EPA contaminated sediment efforts*

- **Priorities**
- *- Impacts to resources – Must Have*
- *- Physical Processes-fate of fines – Must Have*
- *- Risk and Re/De- Regulation – High Priority*

Results: **Benefits and Resource Agencies** Communication Strategy

- **Started with 15 challenges and added more!**
- **Ranked "ALL" challenges – Must Have!**
- **Boiled down the Evaluation into General Needs topics**
- **It became clear that a Communication Strategy was the goal**
- **Team decided a Road Show would benefit all agencies.**
- **Road Show:**
  - **Support Districts to -**
  - **Educate on Physical Processes of sediment-wave interaction**
  - **Explain potential berm Benefits**
  - **Address Environmental issues**
  - **Demonstrate analysis and evaluation Tools**
  - **Overview of Regulations and Laws**
  - **Story of Pilot Projects – successes and lessons learned**

Benefits and Resource Agencies
Communication Strategy

- **Solution**
  -Educate on the level of risks associated w/ our methodology to stay in compliance
  -Pilot projects tailored w/ extensive monitoring
  -"Flow Chart" of process/placement decisions
- **Tools**
  -Dredge history
  -Example projects
- **What We Can or Can't Answer Now**
  - Depth of Closure
  - Disposal vs. placement
  - Habitat impacts
  - Loss of material once placed in NSP
  - Volume of material lost or placed outside of DoC
  - Get agencies into a meeting, get list of concerns from their perspective, determine project to address it.

Benefits and Resource Agencies Communication Strategy

- **Deficiencies and Successes**
  - *Not constructible – to straight lines, with present equipment, cost*
  - *Intent of agencies concerns not understood*
  - *Provide assurance that compliance items are satisfied (to what extend do we accommodate?)*
  - *Internal communication of pilot projects*
  - *Get industry prospective*
- **Tool Changes, Research Needs, Literature Development, and Communication Tools**
  - *Data. Data. Data!!!!*
  - *Trapezoid shape - not necessarily how material is placed*
  - *Placed vs. disposed (positive reiteration)*
- **% Improvement**
  - *Advertise our capabilities and successes*
- **Low Hanging Fruit**
  - *Road Show*
- **Priorities**
  - *All are Must haves!*

Table 5 Nearshore Berm Criteria Example Quantifing Benefits and Impacts

Example:

- Most berms are described as either “Feeder” or “Stable.
- Many berms are a combination of feeder and stable.
- Is it a feeder berm if the material moves from the berm or does it have to reach the beach?
- We need to do a better job of communication the fate of the material.
- Hands and Allison gave no criteria for how they defined a berm to be a feeder….
- Present methods look at the depth of placement of the base, not the volume of sediment place above sediment movement threshold (like Hallermeier eq.)

Suggested New Method of Reporting a Berm’s expected material fate:

Quantify Fate of Sediment for Nearshore Berm and Rate of Fate of Nearshore Berm

	1-3 years	4-10 years	Stable	Reporting Standard
Sediment added to Transport zone	50%	30%	20%	50/30/20 berm or 80% Feeder berm
Sediment added to beach	10%	10%		20% beach feeder berm

Low-Hanging Fruit and Berm Implementation Outline

- Low Hanging Fruit
  - 19 Low-Hanging Fruit identified
  - Tools, maps, models, flow diagrams...
  - Web site information updated!
  - Of all of the low hanging fruit that we can work towards, the one thing that seems to have the greatest impact is assisting the District with stakeholder meetings to discuss the present understanding of nearshore placements and their impact to various physical, environmental, and social aspects……..Road Show
- Implement Berm at X Inlet – an outline of the steps

Take Home Message

- **A couple to mention..**
  - Distinguish between “Large-scale morphologic features designed to behave as a discretely onshore migrating bar” and “Dispersive placements that enhance the littoral volume of a region”
  - More links to regulations, available tools, guidance, and pilot studies. (defn., diagram, flow charts)
  - A functional argument for the across-shore gradient of probable movement and temporal component
  - Regional/district level stakeholder meetings about the science
  - Littoral and shoal zone misunderstood- describe region of potential sediment movement as **Transport Zone** – extending from depth of closure to dry beach crest
  - DOTS request available to support Districts
  - Berms cannot be built as straight line trapezoids

Moving Forward

- Meeting results will be used to help frame research objectives
  - Needs and challenges
  - Priorities
  - Low hanging Fruit
  - 2 Statements of Need out of the meeting
    - Economical Sediment Tracers
    - % Grain Size by Volume instead of by weight
- Road Show Development
- Depth of Closure
  - Theory Summary
  - Mobility Indices to locate DoC by grain size
  - **Case Studies-** Starting with West Coast

R&D in FY14

- **Tasks**
  - **Districts participation in comments/suggestions for Tables. Due 10 April (w/CWG Meeting reminder)**
  - **Complete existing DoC maps and add to eBerm**
  - **Update Berm Websites**
    - **Infohttp://rsm.usace.army.mil/Nearshore/index.html**
    - **http://geoplatform.usace.army.mil/home/item.html?id=576515c889fd4d7991d1cb026fc3d4ad**
  - **Draft RSM-TN on meeting and commented results.**
  - **Develop improved methodology for challenges…(Work with Gtran, PMT folks to improve our calculations.)**

Discussion?